

CLAIMS:

1. An information recognition device, comprising:
  - thermal radiation detection means for detecting, by a thermal radiation sensor, thermal radiation emitted from an object-to-be-detected existing in a detection range;
  - behavior pattern model storage means for storing a behavior pattern model obtained by modeling output of the thermal radiation sensor depending on a behavior pattern of an object-to-be-detected by using a predetermined modeling method; and
  - information recognition means for recognizing predetermined information relating to the object-to-be-detected existing in the detection range based on a detection result of the thermal radiation detection means and the behavior pattern model stored in the behavior pattern model storage means.
2. The information recognition device according to claim 1, wherein
  - the behavior pattern model storage means stores plural behavior pattern models depending on respective types of behavior patterns.
3. The information recognition device according to claim 1 or 2, further comprising:
  - behavior pattern model generation means for generating the behavior pattern model of the object-to-be-detected based

on the output of the thermal radiation sensor by using the predetermined modeling method.

4. The information recognition device according to any of  
5 claims 1 to 3, wherein

the thermal radiation sensor is a thermo-sensor.

5. The information recognition device according to any of  
claims 1 to 3, wherein

10 the thermal radiation sensor is a quantum sensor.

6. The information recognition device according to any of  
claims 1 to 3, wherein

the thermo-sensor is a pyroelectric infrared sensor for  
15 detecting infrared emitted from the object-to-be-detected  
using a pyroelectric effect.

7. The information recognition device according to any of  
claims 1 to 6, wherein

20 the predetermined modeling method is an HMM (hidden Markov  
model).

8. The information recognition device according to any of  
claims 1 to 7, wherein

25 the predetermined information comprises at least one of  
action contents of the object-to-be-detected, a moving speed  
of the object-to-be-detected, and a size of the  
object-to-be-detected.

9. The information recognition device according to any of claims 1 to 8, wherein

the predetermined information comprises attribute  
5 information about the object-to-be-detected.

10. The information recognition device according to any of claims 1 to 9, wherein

the information recognition means extracts feature data  
10 from a detection result of the thermal radiation detection means, calculates likelihood between the feature data and the behavior pattern model based on the feature data and the behavior pattern model stored in the behavior pattern model storage means, and recognizes predetermined information  
15 relating to the object-to-be-detected based on the calculated likelihood.

11. The information recognition device according to claim 10, wherein

20 the feature data comprises first feature data constituted by a spectrum in a frame unit of a detection result of the thermal radiation detection means and second feature data constituted by an average amplitude value of the spectrum in the frame unit.

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12. The information recognition device according to claim 11, wherein

the first feature data is obtained by transforming a value of the spectrum in the frame unit into a value of a common logarithm.

5 13. The information recognition device according to claim 11 or 12, wherein

the feature data further comprises third feature data constituted by a difference between feature indicated by the first feature data of a selected frame and feature indicated  
10 by the first feature data of the frame immediately before the selected frame.

14. The information recognition device according to claim 13, wherein

15 the feature data further comprises fourth feature data constituted by a difference between feature indicated by the second feature data of a selected frame and feature indicated by the second feature data of the frame immediately before the selected frame.

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15. The information recognition device according to any of claims 1 to 14, wherein

when the behavior pattern model is constituted by the feature data of a high dimension of four or more, the device  
25 comprises:

feature data display means for displaying the feature data corresponding to each behavior pattern model stored in

the behavior pattern model storage means as a coordinate point in a two- or three-dimensional space; and

detection result display means for displaying a coordinate point corresponding to a detection result of the thermal radiation detection means in a space in which the coordinate point of the feature data is displayed.

16. An information recognition method, comprising:

detecting, by a thermal radiation sensor, thermal radiation emitted from an object-to-be-detected existing in a detection range;

preparing a behavior pattern model obtained by modeling output of the thermal radiation sensor depending on plural types of behavior patterns of plural objects-to-be-detected by using a predetermined modeling method; and

recognizing predetermined information relating to the object-to-be-detected existing in the detection range based on a detection result of the thermal radiation sensor and the behavior pattern model.

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17. An information recognition program executed by a computer, comprising:

a thermal radiation detecting step of detecting, by a thermal radiation sensor, thermal radiation emitted from an object-to-be-detected existing in a detection range;

a behavior pattern model storing step of storing a behavior pattern model obtained by modeling output of the thermal radiation sensor depending on plural types of behavior patterns

of plural objects-to-be-detected by using a predetermined modeling method; and

an information recognizing step of recognizing predetermined information relating to the

5 object-to-be-detected existing in the detection range based on a detection result in the thermal radiation detecting step and the behavior pattern model stored in the behavior pattern model storing step.

10 18. An alarm system, comprising:

the information recognition device according to any of claims 1 to 15;

determination means for determining whether or not the object-to-be-detected is a person based on a recognition result  
15 of the information recognition device; and

alarm means for raising an alarm when the determination means determines that the object-to-be-detected is a person.